SUSTAINABLE ENERGY STANDARD
For The International Energy Conservation Code, 2003 Edition
Regionally specific for the Tucson Metropolitan Area

The following modifications to the International Energy Conservation Code, 2003 Edition are deemed to be a sustainable energy standard:

(Editorial Note: This Energy Standard has been updated from the original Sustainable Energy Standard, CABO Model Energy Code, 1995 Edition, dated 4-22-98. While this standard may be beneficial for many regions it is specific to the Tucson Metropolitan area. This standard is not to conflict with the previous Sustainable Energy Standard or amendment to locally adopted codes.)

Chapter 1 - Administration And Enforcement

Section 101.1 Title. Delete Brackets and "Name of Jurisdiction".

Section 101.2 Scope. Add a paragraph to read:

The calculated target annual energy consumption of the building lighting, mechanical system, and domestic hot water heating shall be less than 50% of the energy required by the ANSI/ASHRAE/IESNA Standard 90.1-2001 without amendments for the purpose of calculating the minimum base case, otherwise buildings must also meet the adopted International Energy Code of this jurisdiction. In addition, the minimum displacement goal of energy by solar devices is prescribed as a function of residential bedrooms at 550kWh/br/yr. Displacement for other structures is prescribed in tables relating displacement goals as a function of the buildings' use and occupancy. Buildings that show proof of LEED registration at the silver level with a LEED Accredited Professional as part of the design team shall be deemed compliant with this standard. New buildings must achieve a minimum of 7 points from LEED credits EA1 (Optimize Energy Performance) and EA2 (Renewable Energy). Existing buildings must achieve 9 points from LEED credits EA1 and EA2. Commercial buildings shall demonstrate that 5% of the total annual building lighting, mechanical system and domestic hot water heating energy consumption is offset by the use of solar energy for all methods of compliance.

Exception: For each 5% of building lighting, mechanical system and domestic hot water heating energy budget that is offset with co-generation the solar requirement may be decreased by 1% to a minimum of 1% solar energy utilization.

Section 102.4 Delete after "of" and add: , and there shall be a verification of proper installation of insulation before drywall installation, and the completion of the "Insulation Installation Warranty" and signature by a representative of the developer and/or builder.

Section 102.5.2 Change the first sentence to read: Whole-window assembly U-factor, solar heat gain coefficient, visible light transmittance and air leakage values of fenestration products ...

Section 102.6 Equipment. Add a new subsection to read:

102.6.1 Residential buildings constructed under the provisions of this standard shall be permitted to use refrigerated air conditioning systems selected under the guidelines of the Air Conditioning Contractors of America (ACCA) Manual J Procedures, Specifically Sections 7-27, 7-28 and 7-29 at outside conditions of 105 degrees F and inside conditions of 75 degrees F. Other provisions of this standard notwithstanding, air conditioning equipment shall have a minimum SEER of 12.5.

102.6.2 Evaporative cooling. Evaporative cooling may be used for cooling or to reduce air conditioning requirements but may not be used as the method of compliance to this standard except for commercial buildings that use evaporative cooling as an economizer cycle on a refrigeration or air conditioning application. Duct leakage through the evaporative device shall be minimized during air conditioning and heating modes of operation.

102.6.3 Water Heating. The following service water heating systems are the only methods acceptable:

a. Solar water heaters.
b. Instant gas or electric water heaters.
c. Heat pump electric water heaters.
d. Heat recovery water heaters from air conditioning or other sources.
e. Gas water heaters exceeding 80% efficiency.
f. Passive Solar with in-collector storage (ICS), thermal siphon and alike shall be installed with no more than a total of 20 linear feet of piping between the solar system and the storage tank.

Exception: Other methods acceptable to the authority having jurisdiction showing 50% reduction of water heating energy consumption.

Water heating systems that serve only hand sinks and/or a single mop sink may use a water heater with up to 20 gallons of storage.

Section 104.1 General: Add a sentence at the end of the paragraph to read:

Plans and specifications shall show the method of utilizing "beneficial use of solar energy".

Add a new section to read:

SECTION 108
WOOD-BURNING or GAS FIREPLACES and WOOD STOVES

108.1 Wood-burning stoves. Wood-burning stoves shall be labeled to show compliance with the U. S. Environmental Protection Agency (EPA) Phase II standards for particulate emissions during operation.

Catalytic stoves shall have an accessible, modular, replaceable catalyst element.

108.2 Fireplaces. Wood-burning fireplaces and gas fireplaces shall produce useful heat and be provided with a means of supplying 100% of the combustion air for operation from the outside, and shall limit particulate emissions to less than 7.5 grams per hour. All fireplaces shall be provided with a tight fitting glass door and a positive means of circulating the heated air in the occupied space.

108.3 Solar Backup. A wood-burning stove or fireplace shall be considered as providing the required space heating energy only when installed as backup energy for a solar-thermal collection system.

Chapter 2 - Definitions

Positive Cooling Supply: Insert including evaporative cooling systems, between "cooling" and "deliberately"

Add the following new definitions:

Civano: A Tucson Solar Village, a model sustainable community; a vision of the future where resource consumption is reduced through more efficient technologies, use of solar energy and lifestyles which promote greater harmony and balance with the natural environment; a community in the spirit of the "Civano" period, a golden era of the Hohokam culture which balanced natural resources and human needs; incorporates and demonstrates strategies for achieving more sustainable development.

Sustainable Development: "Development that meets the needs of the present without compromising the ability of future generations to meet their needs." (UN World Commission on the Environment and Development)

Beneficial Use of Solar Energy: The following devices/methods may be used to demonstrate compliance:

- Solar space heating systems.
- Trombe wall or clear view collectors for space heating.
- Solar Photovoltaic systems.
- Solar thermal/electric power generating systems, including stand-alone and grid connected parabolic trough and dish Stirling.
- Solar day lighting system using controls to turn off or dim electric lights.
- Solar day lighting systems specifically designed to capture and redirect visible solar energy while controlling infrared energy (conventional skylights are specifically excluded) for at least one half of the non-bedroom space.
- Passive building heating for the winter through the use of optimum window shade structures and orientation.
- Solar water systems for domestic water heating or space heating.
- Solar pool or spa water heating - see also 504.5.

Power Density: The total connected power load of all components of a building system, including all auxiliary components and circuitry, without regard to the timing, scheduling, or control of their operation, in w/ft^2 or $Btu\text{-}h/ft^2$.

Site Energy: Energy, other than recovered energy, utilized for any purpose on the site.

Source energy consumption shall be determined by multiplying the site energy usage in kBtu-h per square foot by the following factors:

Site Energy	Factor
Electric	3.10
Gas	1.11
Wood	1.00
Solar (amount of displaced electric or gas)	0.00

Bedrooms: A room including clothes closets that may be used for sleeping purposes.

Chapter 3 - Design Conditions

Table 302.1 Exterior design conditions: Revise the table as follows:

Table 302.1
Exterior Design Conditions

WINTER	DESIGN DRY BULB TEMP.	32 F
SUMMER	DESIGN DRY BULB TEMP.	104 F
	DESIGN WET BULB TEMP.	66 F
DEGREE DAYS HEATING		7000
DEGREE DAYS COOLING		2814
CLIMATIC ZONE		14A

Chapter 4 - Residential Building Design By Systems Analysis And Design Of Buildings Utilizing Renewable Energy Sources

Section 402.1 Analysis Procedure.

Add a sentence at the end of the first paragraph to read: Domestic hot water energy use shall be calculated separately from glazing systems, heat storage, thermal envelope and space conditioning equipment and shall meet the energy reduction percentages of section 101.2.

Section 402.5 Calculation Procedure Add:

402.5.4 The occupied mode shall be not less than 10 hours in a 24-hour period.

Section 402.6 Documentation. Add to the last sentence to read: .... Chapter 4 and that the derived proposed design is a minimum of 50 percent of the standard design.

Chapter 5 - Residential Building Design By Component Performance Approach

Section 502.1.2 Revise Title to "Masonry or Earthen Materials" and the note by placing a comma after "masonry", and adding "earthen materials," between "masonry" and "or".

Section 502.1.5 Change solar heat gain coefficient from 0.4 to 0.35.

Note: solar heat gain coefficient = shading coefficient X 0.87.

Table 502.2. Add the following values:

Table 502.2
HEATING AND COOLING CRITERIA

ELEMENT	MODE	TYPE A-1 BUILDINGS	TYPE A-2 BUILDINGS
		U_o	U_o
Walls	Heating or cooling	0.11	0.17
Roof/Ceiling	Heating or cooling	0.026	0.026
Floors over unheated spaces	Heating or cooling	0.05	0.05
Heated slab on grade	Heating	R-Value 8	R-Value 8
Unheated slab on grade	Heating	R-Value 0	R-Value 0
Basement wall	Heating or cooling	U-Factor 0.095	U-Factor 0.095
Crawl space wall	Heating or cooling	U-Factor 0.06	U-Factor 0.06

Delete all footnotes.

Section 502.2.1.4 and 502.2.3.4 Slab-on-grade floors: Delete in its entirety.

Table 503.2 Change the values in the fourth column (Minimum Performance) from HSPF ~~6.8~~ and ~~6.6~~ to 7.0 and 7.0 respectively, change SEER values in the fourth column (Minimum Performance) from ~~10~~ and ~~9.7~~ to 12.5 and 12.5, respectively

Section 502.3.3 Recessed lighting fixtures. Change the following:

502.3.3 Recessed lighting fixtures. When installed in the building envelope, recessed light fixtures shall be sealed to prevent air leakage into or from the conditioned space.

Section 503.3.3.1 Piping Insulation. Delete exceptions 2, and 3.

Section 503.3.3.4.2 add to end: All low pressure ducts shall be leak tested in accordance with this standard. The tested rate of air leakage is not to exceed 3% of conditioned floor area in CFM at 25 Pascals (0.1 inches WC) prior to drywall and air handling equipment installation. A representative of the developer and/or builder will perform a field inspection and leakage test of the ductwork before drywall installation. The field representative will certify successful completion of this test.

Section 504.3 Add the following at the beginning of the paragraph: All recreational swimming pools and spas shall utilize solar energy as the only water heating source. Medical and rehabilitation pools smaller than 3,000 gallons water capacity shall use solar energy as the primary water heating source, with a new energy source permitted as backup.

Section 504.4 Delete "conveniently", place a period after “automatically” and delete the rest of the sentence.

Add: **Section 505.3 Lighting fixture efficacy.**

505.3 Lighting fixture efficacy. All general purpose lighting fixtures in kitchen, laundry room, utility room, equipment room, and garage, and those that are required by other Codes at entries on the exterior of buildings shall be so constructed as to accept only lamps with efficacy greater than 40 lumens/watt.

Exception: Those fixtures designed for spot or flood type lamps and those fixtures controlled by a permanently installed dimmer.

Add: **Section 505.4 Exterior lighting fixture controls.**

505.4 Exterior lighting fixture controls. Exterior lighting fixtures shall be controlled by a time switch with astronomic adjustment or a photo sensor. A standard time switch may be incorporated with the photo sensor to turn the lights off at a desired time before dawn. All time switches shall incorporate a minimum 2 hour carry through of the program.

Add a new section:
Section 506. Energy Consumption - Other Than Electrical. In multifamily dwellings , provisions shall be made to determine the energy consumed by each tenant by separately metering individual dwelling units or tenant spaces.

Chapter 6 - Simplified Prescriptive Requirements

For this procedure use climate zone 15 (7,000 HDD)
602.2 (same as 502.1.5.)

Chapter 7 - Building Design For All Commercial Buildings

For the purpose of calculation the ANSI/ASHRAE/IESNA Standard 90.1-2001 shall be used to establish the baseline case without amendments.

Chapter 8 - Design By Acceptable Practice For Commerical Buildings

Delete entire chapter.

Chapter 9 - Climate Maps

Delete entire chapter.